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Indexed in Current Contents

# Forthcoming Papers

**Rainer Link,** Institut für Kernphysik der Technischen Hochschule Darmstadt:

**Magnetic Hyperfine Interaction in Muonic Indium, Osmium and Mercury**

The magnetic hyperfine interaction in several muonic atoms has been measured. The magnetic splittings of the $1s_{1/2}$, $2s_{1/2}$ and $2p_{1/2}$ muon states in the $9/2^+$ ground state of $^{115}$In, determined by measuring muonic X rays are

$$\Delta E_{mag}(1s_{1/2}, {}^{115}\text{In}\ 9/2^+) = 3580 \pm 70\ \text{eV}$$

$$\Delta E_{mag}(2s_{1/2}, {}^{115}\text{In}\ 9/2^+) = 525 \pm 120\ \text{eV}$$

$$\Delta E_{mag}(2p_{1/2}, {}^{115}\text{In}\ 9/2^+) = 850 \pm 180\ \text{eV}.$$

The magnetic splitting of nuclear $\gamma$ rays in the presence of a muon in the $1s_{1/2}$ state yields for the $1/2^-$ ground state in $^{199}$Hg

$$\Delta E_{mag}(1s_{1/2}, {}^{199}\text{Hg}\ 1/2^-) = 468 \pm 116\ \text{eV}$$

and the following values for the first excited $2^+$ states in the nuclei $^{190,192}$Os and $^{200}$Hg:

$$\Delta E_{mag}(1s_{1/2}, {}^{190}\text{Os}\ 2^+) = 665 \pm {}^{80}_{40}\ \text{eV}$$

$$\Delta E_{mag}(1s_{1/2}, {}^{192}\text{Os}\ 2^+) = 800 \pm 80\ \text{eV}$$

$$\Delta E_{mag}(1s_{1/2}, {}^{200}\text{Hg}\ 2^+) = 655 \pm {}^{105}_{75}\ \text{eV}.$$

These data are compared with calculations using different nuclear models.

**W.v. Drachenfels, U.T. Koch, R.D. Lepper, Th. Müller, and W. Paul,** Physikalisches Institut der Universität Bonn:

**Intense Pulses of Polarized Electrons Produced by Fano Effect**

A pulsed polarized electron source using the Fano effect on cesium is described in detail. A frequency doubled dye laser producing 2 mJ/pulse at 305 nm is used as the source of circularly polarized light. The light beam interacts with an array of 20 atomic beams. The atomic beam oven operates in a closed cycle thereby increasing running time by a factor of 30. Intensities of $3 \times 10^9\ e^-/0.5\ \mu s$ with a polarization of 90% have been routinely obtained.

**K.D. Böklen,** Institut für Angewandte Physik der Universität Bonn:

**Resonance Shifts in ABMR due to Inhomogeneities of the Magnetic and rf-Fields**

On the basis of the non-relativistic time dependent Schrödinger theory shifts of the resonance frequency due to an arbitrary inhomogeneity of the rf-field with respect to amplitude, direction and phase, and shifts due to small inhomogeneities of the magnetic field are considered. A general relation is derived by which one can find the appropriate experimental methods to determine the shifts without a detailed knowledge of the actual line shapes. Usually small effects as shifts due to non-constant field direction or due to neighbouring states are included in the formalism. The results have been used successfully in precision experiments in which frequency shifts of about $10^{-2}$ of the resonance width were eliminated up to a few $10^{-5}$.

**U. Hauser, W. Neuwirth, W. Pietsch, and K. Richter,** Erstes Physikalisches Institut, Universität zu Köln, Köln:

**On the Determination of Collision Cross Sections by Nuclear Doppler Shift**

We report on measurements of the energy loss of ions in matter by "Inverted Doppler Shift Attenuation" (IDSA). This new method is an inversion of the "Doppler Shift Attenuation" (DSA) method for the determination of lifetimes of nuclear states. While in DSA the exact knowledge of the velocity dependent energy loss function $dE/ds$ is required, it is shown that in IDSA this function or the absolute collision cross section, respectively, can be determined from the Doppler spectrum of an excited nuclear fragment recoiling in matter, whose lifetime is known. No corrections or assumptions concerning the collision processes are necessary.
$^7$Li* fragments ($E_\gamma = 478$ keV) from the $^{10}$B$(n,\alpha)^7$Li* reaction produce an easily observable and analysable Doppler spectrum. Here boron must be a constituent or an implanted impurity of the material to be investigated. The experimental set-up is described. An exact relativistic analysis of the Doppler spectrum is given. The measured collision cross sections turn out (a) to be proportional to $v$ within the range $1.5 \cdot 10^8 \leqq v \leqq 4.8 \cdot 10^8$ cm/sec, (b) are thus only due to pure "electronic" collisions, and (c) sensitively dependent on the charge distributions of the target atoms.

**S. Büttgenbach, M. Herschel, G. Meisel, E. Schrödl, and W. Witte,** Institut für Angewandte Physik der Universität Bonn,
**W.J. Childs,** Institut für Angewandte Physik der Universität Bonn, Argonne National Laboratory, Argonne, Illinois, U.S.A.:

**Hyperfine Structure Measurements in the Ground States $^5F_5$, $^5F_4$, $^5F_3$ and $^5F_2$ of $^{99}$Ru and $^{101}$Ru with the Atomic Beam Magnetic Resonance Method**

The hyperfine structure of the four lowest levels $^5F_{5,4,3,2}$ of the $^5F$ ground state multiplet arising from the configuration $4d^7\,5s$ in $^{99}$Ru and $^{101}$Ru has been studied by the atomic–beam magnetic–resonance technique. After applying corrections due to the effects of off-diagonal hyperfine mixing we obtain the following multipole interaction constants:

| | | |
|---|---|---|
| $^{99}$Ru: | $A(^5F_5) = -204.5514(33)$ MHz | $B(^5F_5) = 27.281(62)$ MHz |
| | $A(^5F_4) = -163.6845(36)$ MHz | $B(^5F_4) = 17.455(52)$ MHz |
| | $A(^5F_3) = -135.0294(37)$ MHz | $B(^5F_3) = 10.164(50)$ MHz |
| | $A(^5F_2) = -82.5325(27)$ MHz | $B(^5F_2) = 5.457(22)$ MHz |
| $^{101}$Ru: | $A(^5F_5) = -229.2881(33)$ MHz | $B(^5F_5) = 158.934(62)$ MHz |
| | $A(^5F_4) = -183.4744(36)$ MHz | $B(^5F_4) = 101.799(52)$ MHz |
| | $A(^5F_3) = -151.3502(38)$ MHz | $B(^5F_3) = 59.323(50)$ MHz |
| | $A(^5F_2) = -92.4974(27)$ MHz | $B(^5F_2) = 31.869(23)$ MHz. |

The magnetic dipole and the electric quadrupole moments of the $^{99}$Ru and $^{101}$Ru nuclear ground states as calculated from these constants are the following:

$\mu_I(^{99}\text{Ru}) = -0.594(119)$ nm  $Q(^{99}\text{Ru}) = 0.077(15)$ barns
$\mu_I(^{101}\text{Ru}) = -0.666(133)$ nm  $Q(^{101}\text{Ru}) = 0.45\ (9)$ barns.

From measurements of the Zeeman effect in the even isotope $^{102}$Ru we find the following $g_J$-factors for the $^5F$ ground multiplet:

$g_J(^5F_5) = 1.397741(20)$  $g_J(^5F_4) = 1.347604(20)$
$g_J(^5F_3) = 1.248988(20)$  $g_J(^5F_2) = 1.001120(3)$.

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The manuscript should be typed double-spaced, on one side of letter-size white bond paper. Form and content should be carefully checked before submission to exclude the need for later corrections, as authors will receive only one set of proofs. For technical reasons, papers are made up into pages right away; it is therefore essential that manuscripts be submitted in their **final form.** The approximate positions of figures and tables must be marked in the margin.

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**journal papers:**

5. Andersen, N., Carriveau, G.W., Glinska, A.F., Jensen, K., Melskens, J., Veje, E.: Z. Physik **253**, 53 (1972)

**books:**

6. Flanagan, J.L.: Speech analysis, synthesis and perception, 2nd ed. pp. 89–97. Berlin-Heidelberg-New York: Springer 1972

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single underlining = small letter
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**yellow** = Roman (i.e. the normal typeface used for the text) abbreviations like Re, Im, grad, div, lim, exp, sin, cos, tan, ctan, all units and chemical elements.

**brown** = Boldface: headings, letters in formulas, vectors
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**a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z**

**red** = Greek
$\Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Phi, \Psi, \Omega,$
$\alpha, \beta, \gamma, \delta, \varepsilon, \zeta, \eta, \vartheta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \tau, \upsilon, \varphi, \phi, \chi, \psi, \omega$

**green** = Script:
$\mathcal{A}, \mathcal{B}, \mathcal{C}, \mathcal{D}, \mathcal{E}, \mathcal{F}, \mathcal{G}, \mathcal{H}, \mathcal{I}, \mathcal{J}, \mathcal{K}, \mathcal{L}, \mathcal{M}, \mathcal{N}, \mathcal{O}, \mathcal{P}, \mathcal{Q}, \mathcal{R}, \mathcal{S}, \mathcal{T}, \mathcal{U}, \mathcal{V}, \mathcal{W}, \mathcal{X}, \mathcal{Y}, \mathcal{Z}$
$a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z$

**blue** = Gothic:
$\mathfrak{A}, \mathfrak{B}, \mathfrak{C}, \mathfrak{D}, \mathfrak{E}, \mathfrak{F}, \mathfrak{G}, \mathfrak{H}, \mathfrak{I}, \mathfrak{J}, \mathfrak{K}, \mathfrak{L}, \mathfrak{M}, \mathfrak{N}, \mathfrak{O}, \mathfrak{P}, \mathfrak{Q}, \mathfrak{R}, \mathfrak{S}, \mathfrak{T}, \mathfrak{U}, \mathfrak{V}, \mathfrak{W}, \mathfrak{X}, \mathfrak{Y}, \mathfrak{Z}$
$\mathfrak{a}, \mathfrak{b}, \mathfrak{c}, \mathfrak{d}, \mathfrak{e}, \mathfrak{f}, \mathfrak{g}, \mathfrak{h}, \mathfrak{i}, \mathfrak{j}, \mathfrak{k}, \mathfrak{l}, \mathfrak{m}, \mathfrak{n}, \mathfrak{o}, \mathfrak{p}, \mathfrak{q}, \mathfrak{r}, \mathfrak{s}, \mathfrak{t}, \mathfrak{u}, \mathfrak{v}, \mathfrak{w}, \mathfrak{x}, \mathfrak{y}, \mathfrak{z}$

**violet:** the small letter *l* and the capital letter *O* (to distinguish them from the numeral 1 and zero)

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$b\hat{}_{\hat{i}}, a\,{}^{i}_{\vee}$.

The following symbols are frequently confused:
$\cup, \mathbf{\cup}, \bigcup$; $o, O, 0$; $\mathrm{x}, x, X, \varkappa$; $\mathrm{v}, v, \nu$; $\phi, \varphi, \Phi, \varnothing$; $l, 1$; $\varepsilon, \in, \Subset$;
also the handwritten Roman letters:
$c, C$; $k, K$; $o, O$; $p, P$; $s, S$; $u, U$; $v, V$; $w, W$; $x, X$; $z, Z$; $e, l$;
the symbol *a* and the indefinite article a:
Please take care to distinguish them in some way.

**Notations**

| preferred form | instead of | preferred form | instead of |
|---|---|---|---|
| $\exp(-(x^2+y^2)/a^2)$ | $e^{-\frac{x^2+y^2}{a^2}}$ | $\dfrac{\cos(1/x)}{(a+b/x)^{1/2}}$ | $\dfrac{\cos\dfrac{1}{x}}{\sqrt{a+\dfrac{b}{x}}}$ |
| $7/8, (a+b)/c$ | $\dfrac{7}{8}, \dfrac{a+b}{c}$ | $f^{-1}$ | $\bar{f}^{1}$ |

Reimer/Pfefferkorn

# Raster-Elektronenmikroskopie

Von Prof. Dr. L. Reimer u. Prof. Dr. G. Pfefferkorn, Westf. Wilhelms-Universität, Physikalisches Institut

Mit 138 Abbildungen
Etwa 280 Seiten. 1973
DM 68,–

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Die Raster-Elektronenmikroskopie hat sich nach einer stürmischen Entwicklung als unentbehrliches Hilfsmittel für die mikromorphologische Untersuchung von Oberflächen erwiesen. Außer einer Oberflächenabbildung großer Schärfentiefe und einem Auflösungsvermögen von ca. 100 Å mittels Sekundär- und rückgestreuten Elektronen besteht u. a. die Möglichkeit, in integrierten Halbleiterschaltungen Kontraste durch unterschiedliche Potentiale zu erzeugen oder magnetische Streufelder abzubilden. Mit Channelling-Diagrammen lassen sich Orientierungs- und Kristallstrukturanalysen von Bereichen mit 1 µm Ausdehnung durchführen. Ferner ermöglicht die Analyse der emittierten Röntgenstrahlung eine Substanzanalyse und es können auch durch Kathodolumineszenz ausgelöste Lichtquanten zur Bilderzeugung herangezogen werden.
Das Buch soll den mit einem Raster-Elektronenmikroskop arbeitenden Wissenschaftlern und Technikern sowie den Anwendern einen Überblick über die physikalischen Grundlagen des Gerätes und die Kontrastentstehungsmechanismen vermitteln.
Letztere sind besonders wichtig, um eine optimale Bildinterpretation zu gewährleisten. Neben den oben erwähnten Anwendungsmöglichkeiten werden zusätzlich Bildauswertemethoden und spezielle Präparationsmethoden behandelt.

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This book is intended for scientists and technicians working with scanning electron microscopy equipment and will acquaint them with the physical principles of the instrument and the techniques for the production of contrast effects. Special methods are described for the analysis of various materials and crystal.

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Edited by
H. Haken and
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